

Exhibit B

U.S. Patent No. 5,156,592 to Martin et al.	Applicants' Claims	Support in Applicants' Present Specification	Support in Applicants' Parent Appln. Ser. No. 461,684 filed on 1/8/90 U.S. Patent No. 5,209,723 to Twardowski et al.
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1. A flexible catheter for prolonged vascular access, the catheter comprising: an elongate flexible and tubular body having a proximal portion, a distal portion and a permanently curved portion linking the proximal and distal portions so that the curved, the proximal and the distal portions lie naturally in essentially the same plane with the angle contained between the proximal and distal portions being less than 90°, and a septum extending continuously through said portions and lying substantially at right angles to said plane to divide the

1. A catheter for hemodialysis which comprises a flexible catheter tube defining a plurality of separate lumens, said catheter defining an arc angle of generally U-shape in its natural, unstressed configuration, whereby said catheter may be implanted with a distal catheter portion residing in a vein of a patient, said distal catheter portion being of substantially the shape of said vein in its natural, unstressed condition, and a proximal catheter portion residing in a surgically created tunnel extending from the said vein and through the

Fig. 2; p. 14..

Fig. 2; col. 4, lines 51-61.

Figs. 1 and 3; pp. 18-19.

Figs. 1 and 3; col. 6, lines 28-44.

Figs. 1, 3, and 4; p. 16.

Figs. 1, 3, and 4; col. 5, lines 27-33.

Figs. 1, 5, and 6; pp. 14, 20, and 21.

Figs. 1, 5, and 6; col. 4, lines 55-59; col. 7, lines 1-30.

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tubular body into generally D-shaped intake and outlet lumens; intake and outlet tubes coupled to the proximal portion at a proximal end of the body remote from the curved portion to receive incoming fluid from the intake lumen and to supply outgoing fluid to the outlet lumen; and a tip formed on the distal end of the distal portion and including at least one intake opening for receiving the incoming fluid and at least one outlet opening for returning the outgoing fluid.

1. A flexible catheter for prolonged vascular access, the catheter comprising: an elongate flexible and tubular body having a proximal portion, a distal portion and permanently curved portion linking the proximal and distal portions so that the curved, the proximal and

skin of the patient, whereby blood may be removed from said vein through one lumen of the catheter and blood may be returned to said vein through another lumen of the catheter.

19. A flexible catheter for prolonged vascular access, the catheter comprising: an elongate flexible and tubular body having a proximal portion, a distal portion and a permanently curved portion linking the proximal and distal portions so that the curved, the proximal and

Figs. 1, 3, and 4; p. 2.
Figs. 1, 3, and 4; col. 1, lines 31-35.

Figs. 3 and 4; pp. 18-19.
Figs. 3 and 4; col. 6, lines 34-46.

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the distal portions lie naturally in essentially the same plane with the angle contained between the proximal and distal portions being less than 90°, and a septum extending continuously through said portions and lying substantially at right angles to said plane to divide the tubular body into generally D-shaped intake and outlet lumens; intake and outlet tubes coupled to the proximal portion at a proximal end of the body remote from the curved portion to receive incoming fluid from the intake lumen and to supply outgoing fluid to the outlet lumen; and a tip formed on the distal end of the distal portion and including at least one intake opening for receiving the incoming fluid and at least one outlet opening for returning the outgoing fluid.

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the distal portions lie naturally in essentially the same plane with the angle contained between the proximal and distal portions being less than 90°, and a septum extending continuously through said portions and lying substantially at right angles to said plane to divide the tubular body into generally D-shaped intake and outlet lumens; intake and outlet tubes coupled to the proximal portion at a proximal end of the body remote from the curved portion to receive incoming fluid from the intake lumen and to supply outgoing fluid to the outlet lumen; and a tip formed on the distal end of the distal portion and including at least one intake opening for receiving the incoming fluid and at least one outlet opening for returning the outgoing fluid.

Fig. 2; page 14.

Fig. 2; col. 4, lines 60-61.

Figs. 5-6; pp. 20-21.

Figs. 5-6; col. 7, lines 1-29.

Page 2.

Col. 1, lines 32-36.

Figs. 1 and 3; pp. 4-5.

Figs. 1 and 3; col. 2, lines 22-52, col. 4, line 60 to col. 5, line 12.

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Fig. 2.

Fig. 2.

Figs. 1 and 5.

Figs. 1 and 5.

Figs. 1, 3, and 4; col.
5, lines 35-43.
(Cuffs 42, 42a, 42b.)

Figs. 1, 3, and 4; p. 16.
(Cuffs 42, 42a, 42b.)

Figs. 1, 3, and 4; col.
5, lines 35-43.
(Cuffs 42, 42a, 42b.)

Figs. 1, 3, and 4; p. 16.
(Cuffs 42, 42a, 42b.)

20. The flexible catheter of claim 19 in which said portions are round in cross-section.

21. The flexible catheter of claim 20 in which the diameter of the proximal portion is greater than the diameter of the distal portion.

22. The flexible catheter of claim 21 further comprising a cuff of fibrous material surrounding the body where the proximal portion meets the curved portion.

23. The flexible catheter of claim 20 further comprising a cuff of fibrous material surrounding the body where the proximal portion meets the curved portion.

2. A flexible catheter as claimed in claim 1 in which said portions are round in cross-section.

3. A flexible catheter as claimed in claim 2 in which the diameter of the proximal portion is greater than the diameter of the distal portion.

4. A flexible catheter as claimed in claim 3 and further comprising a cuff of fibrous material surrounding the body where the proximal portion meets the curved portion.

5. A flexible catheter as claimed in claim 2 and further comprising a cuff of fibrous material surrounding the body where the proximal portion meets the curved portion.

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Figs. 1, 3, and 4; col. 5, lines 35-43.
(Cuffs 42, 42a, 42b.)

Figs. 1, 3, and 4; p. 16.
(Cuffs 42, 42a, 42b.)

Fig. 1; col. 4, line 65 to col. 5, line 6; Figs. 7-8.

Fig. 1; p. 15; Figs. 7-8.

Fig. 1.

Fig. 1.

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24. The flexible catheter of claim 19 further comprising a cuff of fibrous material surrounding the body where the proximal portion meets the curved portion.

25. The flexible catheter of claim 19 in which the tip includes an extension blending smoothly into the body and forming an extension to the outlet lumen.

26. The flexible catheter of claim 25 in which the at least one intake opening is at a side of the distal portion facing the proximal portion, and in which the extension is at a side of the distal portion remote from the proximal portion.

6. A flexible catheter as claimed in claim 1 and further comprising a cuff of fibrous material surrounding the body where the proximal portion meets the curved portion.

7. A flexible catheter as claimed in claim 1 in which the at least one intake opening at the end of the intake lumen and in which the tip includes a generally cylindrical extension blending smoothly into the body and forming an extension to the return lumen.

8. A flexible catheter as claimed in claim 7 in which the at least one intake opening is at a side of the distal portion facing the proximal portion, and in which the cylindrical extension is at a side of the distal portion remote from the proximal portion.

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9. A flexible catheter as claimed in claim 8 in which said portions are round in cross-section.
10. A flexible catheter as claimed in claim 9 in which the diameter of the proximal portion is greater than the diameter of the distal portion.
11. A flexible catheter as claimed in claim 10 in which said angle is in the range of 0°-20°.
12. A flexible catheter as claimed in claim 8 and further comprising a cuff of fibrous material surrounding the body where the proximal portion meets the curved portion.
27. The flexible catheter of claim 26 in which said portions are round in cross-section.
28. The flexible catheter of claim 27 in which the diameter of the proximal portion is greater than the diameter of the distal portion.
29. The flexible catheter of claim 28 in which said angle is in the range of 0°-20°.
30. The flexible catheter of claim 26 further comprising a cuff of fibrous material surrounding the body where the proximal portion meets the curved portion.

Figs. 1-5.

Figs. 1 and 5.

Figs. 1 and 5.

Figs. 3 and 4; pp. 18-19. Note that the "almost a 180° arc angle" disclosed in this application is substantially the same as an "angle" of near 0° as the angle is defined in this claim.

Figs. 3 and 4; col. 6, lines 34-44. Note that the "almost 180° arc angle" disclosed in this patent is substantially the same as an "angle" of near 0° as the angle is defined in this claim.

Figs. 1, 3, and 4; p. 16. (Cuffs 42, 42a, 42b.)

Figs. 1, 3, and 4; col. 5, lines 35-43. (Cuffs 42, 42a, 42b.)

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13. A flexible catheter as claimed in claim 1 in which the at least one intake opening is at a side of the distal portion facing the proximal portion, and in which the outlet opening is at a side of the distal portion remote from the proximal portion.

31. A flexible catheter of claim 19 in which the at least one intake opening is at a side of the distal portion facing the proximal portion, and in which the outlet opening is at a side of the distal portion remote from the proximal portion.

Fig. 1.

Fig. 1.

14. A flexible catheter as claimed in claim 13 in which said portions are round in cross-section.

32. The flexible catheter of claim 31 in which said portions are round in cross-section.

Figs. 1-5.

Figs. 1-5.

15. A flexible catheter as claimed in claim 14 in which the diameter of the proximal portion is greater than the diameter of the distal portion.

33. The flexible catheter of claim 32 in which the diameter of the proximal portion is greater than the diameter of the distal portion.

Figs. 1 and 5.

Figs. 1 and 5.

16. A flexible catheter as claimed in claim 15 in which said angle is in the range of 0°-20°.

34. The flexible catheter of claim 33 in which said angle is in the range of 0°-20°.

Figs. 3 and 4; pp. 18-19. Note that the "almost a 180° arc angle" disclosed in this application is substantially the same as an "angle" of near 0° as the angle is defined in this claim.

Figs. 3 and 4; col. 6, lines 34-44. Note that the "almost 180° arc angle" disclosed in this patent is substantially the same as an "angle" of near 0° as the angle is defined in this claim.

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17. A flexible catheter as claimed in claim 13 and further comprising a cuff of fibrous material surrounding the body where the proximal portion meets the curved portion.

35. The flexible catheter of claim 31 further comprising a cuff of fibrous material surrounding the body where the proximal portion meets the curved portion.

18. A flexible catheter as claimed in claim 1 in which the distal portion is sufficiently flexible to be deformed readily to follow the shape of a vein after entry, and in which the proximal portion is more rigid than the distal portion.

36. The flexible catheter of claim 19 in which the distal portion is sufficiently flexible to be deformed readily to follow the shape of a vein after entry, and in which the proximal portion is more rigid than the distal portion.

19. A flexible catheter as claimed in claim 1 in which said angle is in the range of 0° to 20°.

37. The flexible catheter of claim 19 in which said angle is in the range of 0° to 20°.

Figs. 1, 3, and 4; p. 16. (Cuffs 42, 42a, 42b.)

Figs. 1, 3, and 4; col. 5, lines 35-43. (Cuffs 42, 42a, 42b.)

Fig. 5; p. 6 and 20.

Fig. 5, col. 3, lines 11-18, col. 7, lines 4-14.

Figs. 3 and 4; pp. 18-19. Note that the "almost a 180° arc angle" disclosed in this application is substantially the same as an "angle" of near 0° as the angle is defined in this claim.

Figs. 3 and 4; col. 6, lines 34-44. Note that the "almost 180° arc angle" disclosed in this patent is substantially the same as an "angle" of near 0° as the angle is defined in this claim.

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1. A flexible catheter for prolonged vascular access, the catheter comprising: an elongate flexible and tubular body having a proximal portion, a distal portion and a permanently curved portion linking the proximal and distal portions so that the curved, the proximal and the distal portions lie naturally in essentially the same plane with the angle contained between the proximal and distal portions being less than 90°, and a septum extending continuously through said portions and lying substantially at right angles to said plane to divide the tubular body into generally D-shaped intake and outlet lumens; intake and outlet tubes coupled to the proximal portion at a proximal end of the body remote from the

38. A flexible catheter for prolonged vascular access, the catheter comprising: an elongate flexible and tubular body having a proximal portion, a distal portion and a permanently curved portion linking the proximal and distal portions so that the curved, the proximal and the distal portions lie naturally in essentially the same plane with the angle contained between the proximal and distal portions being less than 90°; intake and outlet tubes coupled to the proximal portion at a proximal end of the body remote from the curved portion to receive incoming fluid from the intake lumen and to supply outgoing fluid to the outlet lumen; and a tip formed on the distal end of the distal portion and including at

Figs. 3 and 4; pp. 18-19. Figs. 3 and 4; col. 6, lines 34-46.

Figs. 5-6; pp. 20-21.

Figs. 5-6; col. 7, lines 1-29.

Page 2.

Col. 1, lines 32-36.

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curved portion to receive incoming fluid from the intake lumen and to supply outgoing fluid to the outlet lumen; and a tip formed on the distal end of the distal portion and including at least one intake opening for receiving the incoming fluid and at least one outlet opening for returning the outgoing fluid.

least one intake opening for receiving the incoming fluid and at least one outlet opening for returning the outgoing fluid.

Figs. 1 and 3; pp. 4-5.

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Figs. 1 and 3; col. 2,
lines 22-52, col. 4,
lines 60 to col. 5, line
12.